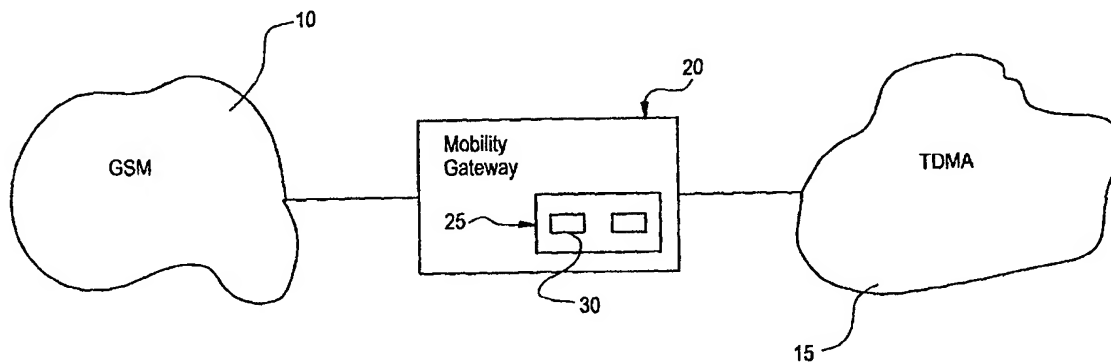




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(54) Title: METHOD AND APPARATUS FOR AUTOMATIC SUBSCRIBER PROFILE GENERATION



(57) Abstract

An apparatus and method enabling automatic profile generation between a first (10) and a second (15) network. Upon request of registration from a visitor location register (42) to a mobility gateway (20) between a first (10) and second (15) network, user profile data from the home (52) location register of the mobile station (38) in the first network (10) is extracted. The extracted user profile data is converted into a form for use within the second (15) network and forwarded to a visitor location (42) within the second network (15).

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METHOD AND APPARATUS FOR AUTOMATIC SUBSCRIBER PROFILE GENERATION

RELATED APPLICATIONS

5 This application claims priority from and incorporates herein by reference the entire disclosure of U.S. Patent Serial No. 60/124,918, filed March 17, 1999.

BACKGROUND OF THE INVENTION

Technical Field of the Invention

10 The present invention relates in general to the generation and maintenance of subscriber profiles, and more particularly, to the dynamic generation and maintenance of subscriber profiles between two separate networks having differing technologies.

Description of Related Art

15 Within cellular networks, a mobile subscriber may roam between service areas of different networks. Various techniques have been developed to enable a mobile subscriber to continue being provided with mobile telephone services once they have left their home service area. In a first alternative, once a mobile subscriber travels into a new mobile switching center (MSC) coverage area and turns on their mobile station for the first time, the mobile station attempts to register with the servicing MSC for the area by transmitting an associated identification number known as the international mobile subscriber identity (IMSI) number or mobile identification number (MIN). The serving MSC communicates with the home location register associated with the mobile station using the received IMSI/MIN. This communication is to inform the HLR of the mobile station's new location and to receive requisite subscriber information from the HLR necessary to provide mobile services to the newly registering mobile station.

20 However, when mobile subscribers move between networks utilizing different technologies, for example, a GSM system utilizing a GSM MAP protocol and a TDMA system using a ANSI-41 protocol, the various information required to be

25

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transmitted between the networks creates problems in converting information between the protocols useable by each system.

One of the problems involves the use of user profiles between networks utilizing different technologies. Current implementations of inter-technology roaming require that dual profiles for mobile subscribers be provisioned. One profile resides within the HLR of the user's home network and another profile resides within the roaming gateway (typically an Interworking Location Register (ILR)) of the network in which the mobile subscriber is presently located. The dual profiles contain information on subscriber services such as call waiting, call forwarding, etc. The use of dual profiles creates a provisioning problem for system operators who must define two sets of user profiles and insure that the profiles are consistent, i.e., contain the same information. Provisioning of a profile calls for a system operator to define the services and capabilities available to a subscriber in the HLR. It also describes the configuration of network entity information necessary to operate the HLR/MSC. Thus, some method for providing for dynamic profile creation and management for a user profile in an HLR of a roaming subscriber would greatly assist in the operation of inter-technology roaming.

SUMMARY OF THE INVENTION

The present invention overcomes the foregoing and other problems with a method and apparatus for automatic profile generation between a first network and a second network. A mobility gateway enables the creation of user profile data between a first network, such as a TDMA network, and a second network, such as a GSM network. When a mobile station of the first network is roaming within the second network, the mobile station initially requests registration of the mobile station to the visitor location register presently serving the mobile station. The request is forwarded to a mobility gateway between the first and second networks. In response to the request, user profile data is extracted from the home location register of the mobile station within the first network. The extracted information is converted into a form useable within the second network, and the newly created user profile is forwarded to

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the visitor location register of the second network which is presently serving the mobile station.

Once a user profile has been created within the second network for the mobile station, the user profile may be periodically updated in response to generation of a profile update in the first network. This process involves the transmission of an update request message to the mobility gateway and the conversion of the message to a second message for use in the second network. The second message is transmitted to the visitor location register containing the second user profile wherein the profile is updated in response to the message. A response is provided back to the home location register in the first network notifying of completion of the update.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is made to the following Detailed Description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a functional block diagram illustrating a mobility gateway including the functionality of the present invention between a GSM network and a TDMA network;

FIGURE 2 is a table for mapping of a user profile from TDMA to GSM;

FIGURE 3 is a table for mapping of a user profile from GSM to TDMA;

FIGURE 4 is a signaling diagram illustrating the manner in which a GSM mobile subscriber in a TDMA network generates a user profile using the mobility gateway;

FIGURE 5 is a signaling diagram illustrating a user profile update for a GSM mobile subscriber in a TDMA network;

FIGURE 6 is a signaling diagram illustrating the generation of a user profile using a mobility gateway for a TDMA subscriber in a GSM network; and

FIGURE 7 is a signaling diagram illustrating a user profile update for a TDMA subscriber in a GSM network.

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DETAILED DESCRIPTION OF THE INVENTION

Referring now to the Drawings, and more particularly to FIGURE 1, there is illustrated a block diagram of a GSM network 10 utilizing a GSM MAP protocol interconnected with a TDMA network 15 using a ANSI-41 protocol through a mobility gateway 20. The GSM network 10 enables subscribers to access telecommunications functionalities utilizing GSM technologies. The TDMA network enables mobile subscribers to access telecommunications functionalities using TDMA technologies.

The mobility gateway 20 enables mobile subscribers from the GSM network 20 to roam within the TDMA network 15 and mobile subscribers from the TDMA network to roam within the GSM network 10 while maintaining access to substantially all of the services and functionalities provided to them within their home network. While the present system is described with respect to interconnections between a TDMA system using the ANSI-41 protocol and a GSM system utilizing a GSM MAP protocol, it should be realized that the mobility gateway 20 and discussions with respect thereto may be extended to include other mobile protocols and networks (such as CDMA systems) such that the described system is not limited to use between GSM and TDMA networks.

As mentioned previously, one problem involved in roaming between GSM and TDMA networks is the necessity to provision and maintain two separated user profiles for mobile subscribers roaming between the networks by the system operator. The mobility gateway 20 of the present invention includes an automatic subscriber profile generator functionality 25 that enables dynamic creation of user profiles utilizable by the network into which a mobile subscriber has presently roamed. The automatic profile generation functionality 25 uses a rule based system to map the user services within a profile between standards, to the most appropriate implementation for the system where the subscriber has roamed.

The rules based system may be implemented by a set of tables 30 as more fully illustrated in FIGURES 2 and 3. FIGURE 2 illustrates a table for mapping from a TDMA system to a GSM system. A particular service described within a user profile in a TDMA system is found in the TDMA portion 31 of the table 30 and the corresponding GSM service is output from the table for use in the profile reflecting the

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user services within the GSM system. Likewise, as shown in FIGURE 3, services within a user profile of a GSM system may be found in the GSM portion 32 of a table 30 so that the service may be mapped to the corresponding TDMA equivalent within a TDMA system. In this way, services described within a user profile may be easily mapped from one system to the other by the user profile functionality 25 of the mobility gateway 20.

Referring now to FIGURE 4, there is illustrated a signaling diagram describing registration of a GSM subscriber in a TDMA network wherein a user profile does not presently exist for the roaming GSM subscriber within the TDMA network. A mobile station 38 initially makes a registration access wherein the mobile station attempts to register with the TDMA network by transmitting a registration access message 40 to a TDMA MSC/VLR 42 (the MSC and VLR may be either co-located or separate). In response to the registration access message 40, the TDMA MSC/VLR 42 transmits a registration notification message 45 to the mobility gateway 20 to request what it believes to be the subscriber's TDMA profile. This triggers generation of a user profile for the mobile station subscriber within the TDMA network.

In response to the registration notification message 45, the mobility gateway 20 transmits a location update message 50 to the GSM HLR 52 of the subscriber mobile station 38, since mobile station information is TDMA in nature, and points to the gateway as a pseudo TDMA HLR. From the view of the GSM HLR 52 the location update message 50 comes from a GSM VLR which the mobility gateway 20 mimics. The GSM HLR 52 next transmits one or more insert subscriber data messages 55 back to the mobility gateway 20. The insert subscriber data messages 55 contain subscriber profile data for insertion within the subscriber profile being created within the mobility gateway 20 and enables the mobility gateway to extract the necessary data for the profile. Once received, the subscriber information is converted for insertion into a user profile of a TDMA network using the mapping tables 35 described previously with respect to FIGURE 1.

After receipt of an insert subscriber data message 55 by the mobility gateway 20, an insert subscriber data result message 60 is transmitted back to the GSM HLR 52 to notify the HLR that the transmitted data has been successfully received. After

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all subscriber profile data has been transmitted to the mobility gateway 20, a location update result message 70 is transmitted to the mobility gateway to notify of completion of transmission of the subscriber profile data, and a registration notification return result message 75 is transmitted to the MSC/ VLR 42. The registration notification return result message 75 contains all of the subscriber profile information required by the MSC/VLR for the mobile station 38 to operate within a TDMA network. From the view of the TDMA MSC/VLR 42, the subscriber data information is being provided by a TDMA HLR (which the mobility gateway 20 mimics) storing the subscriber profile data for the subscriber mobile station 38. Finally, the mobile station 38 is transmitted a registration accepted message 80 to notify the mobile station that it has now successfully registered with the TDMA network. The derived profile is maintained in the gateway without the need for subsequent requests to the subscriber's HLR, until the subscriber returns to the home network.

Referring now to FIGURE 5, there are illustrated the messages necessary for an update of a user profile previously created for a GSM subscriber mobile station 38 roaming within a TDMA network 15. Upon receipt of a profile update message 85, from either a GSM network operator or a subscriber, by the GSM HLR 52, the GSM HLR 52 transmits an insert/delete subscriber data message 90 to the mobility gateway 20. The mobility gateway 20 converts the requested profile change into a profile change for a TDMA system using the mapping tables 30 discussed previously.

A qualification directive message 95 is transmitted to the TDMA MSC/VLR 42 presently serving the subscriber mobile station 38 associated with the profile to be changed. The TDMA MSC/VLR 42 updates at 100 the user profile associated with the subscriber mobile station 38. After the profile update is performed, a qualification return result message 105 is transmitted back to the mobility gateway 20 to provide notification that the user profile has been properly updated. The mobility gateway 20 notifies the HLR 52 of the completed update using a insert/delete subscriber data result message 110.

Referring now to FIGURE 6, where there is shown a signaling diagram of a TDMA subscriber registering within a GSM network when a user profile is not presently created within the GSM network for the TDMA subscriber. The subscriber

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mobile station 28 transmits a location update request message 115 to the GSM MSC/VLR 120 (the MSC and VLR may be either co-located or separate) presently serving the subscriber mobile station. The GSM MSC/VLR 120 transmits a location update message 125 to the mobility gateway 20 in order to initiate creation of a subscriber profile. The mobility gateway 20 generates a registration notification message 130 to the subscriber mobile station's TDMA HLR 135. From the HLR's 38 point of view the request is coming from a TDMA VLR. The TDMA HLR 135 obtains the user profile information for the subscriber mobile station 38 and transmits this information back to the mobility gateway 20 within a registration notification return result message 140.

Once the necessary profile information has been received by the mobility gateway 20 from the TDMA HLR 135, the mobility gateway generates a subscriber mobile station profile for the GSM network using the profile generation functionality 25. Once the profile has been generated, the mobility gateway 20 transmits insert subscriber data messages 145 to the serving GSM MSC/VLR 120 to download the generated subscriber profile data to the VLR. Once the subscriber profile has been completely received by the GSM MSC/VLR 120, an insert subscriber data result message 150 is transmitted to the mobility gateway 20 from the GSM MSC/VLR 120. After the profile information has been transmitted to the serving GSM MSC/VLR 120, an update location result message 155 is transmitted back to the GSM MSC/VLR 120. Finally, the GSM MSC/VLR 120 notifies the subscriber mobile station 38 of the completed registration using a location update accept message 160. The derived profile is maintained in the gateway without the need for subsequent requests to the subscriber's HLR, until the subscriber returns to the home network.

Referring now to FIGURE 7, there is illustrated the manner for updating a user profile for a presently registered TDMA subscriber mobile station 38 within a GSM network. The process is initiated by a profile change 165 initiated by either the TDMA network operator or the subscriber. In response to the profile change, the TDMA HLR 135 transmit a qualification directive message 170 to the mobility gateway 20 indicating the changes to be made to the user profile. The profile changes are

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converted by the profile generation functionality 25 to a form useable by the GSM network.

An insert/delete subscriber data message 175 is transmitted from the mobility gateway 20 to the GSM MSC/VLR 120 presently serving the subscriber mobile station 38. The insert/delete subscriber data message 175 includes the profile change information. The GSM MSC/VLR 120 responds by updating the profile within the MSC/VLR with the information contained within the insert/delete subscriber data message 175 at 178. An insert/delete subscriber data result message 180 is transmitted back to the mobility gateway 20 indicating that the necessary changes have been made. The GSM MSC/VLR 120 views the mobility gateway as the home location register of the subscriber mobile station 38. At the same time, the mobility gateway 20 acts as a VLR with respect to the TDMA HLR 135. A qualification directive return result message 185 is transmitted to the TDMA HLR 135 from the mobility gateway 20 to indicate that the profile update has been completed.

The mobility gateway 20 enables user profile data to be extracted from the HLR of the home network of the subscriber mobile station such that the data may then be mapped into the proper protocol for the network where the subscriber mobile station is roaming. The mobility gateway acts as an HLR to the network into which the subscriber mobile station has roamed and acts as a VLR with respect to the HLR of the home network of the subscriber mobile station. This situation is the same whether a TDMA subscriber has roamed into a GSM network or a GSM subscriber has roamed into a TDMA network.

Although a preferred embodiment of the method and apparatus of the present invention has been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it is understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

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WHAT IS CLAIMED IS:

1. An apparatus for automatic profile generation between a first network and a second network comprising:

a first input for receiving user profile data from a home location register within the first network;

a module for generating user profile data for use in the second network by converting user profile data from the home location register in a first form in the first network to a second form for use in a visitor location register of the second network; and

a first output for transmitting the generated user profile data to the visitor location register in the second network.

2. The apparatus of Claim 1, wherein the module further includes:

a first table for converting the user profile data from the first form to the second form; and

a second table for converting the user profile data from the second form to the first form.

3. The apparatus of Claim 1, wherein the first network comprises a TDMA network and the second network comprises a GSM network.

4. The apparatus of Claim 1, wherein the first network comprises a GSM network and the second network comprises a TDMA network.

5. The apparatus of Claim 1, wherein the first network comprises a GSM network and the second network comprises a CDMA network.

6. The apparatus of Claim 1, wherein the first network comprises a TDMA network and the second network comprises a CDMA network.

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7. A method for automatically generating a user profile between a first network and a second network, comprising the steps of:
- requesting registration of a mobile station from a visitor location register to a mobility gateway between the first network and the second network;
 - 5 extracting user profile data from a home location register of the mobile station in the first network using the mobility gateway between the first network and the second network;
 - converting the user profile data from the first network into user profile data useable by the second network; and
 - 10 forwarding the converted user profile data to the visitor location register of the second network.
8. The method of Claim 7, wherein the mobility gateway functions as a home locator register with respect to the second network.
- 15 9. The method of Claim 8, wherein the mobility gateway functions as a visitor location register with respect to the first network.
10. The method of Claim 7, wherein the first network comprises a TDMA network and the second network comprises a GSM network.
- 20 11. The method of Claim 7, wherein the first network comprises a GSM network and the second network comprises a TDMA network.
12. The method of Claim 7, wherein the step of requesting further comprises the steps of:
- transmitting a registration access message from the mobile station of the visitor location register; and
 - transmitting a registration notification message to the mobility gateway
 - 30 from the visitor location register.

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13. The method of Claim 7, wherein the step of extracting further comprises the steps of:

requesting the user profile data by a location update message transmitted from the mobility gateway to the home location register in the second network; and

forwarding the user profile data from the home location register in the second network to the mobility gateway via subscriber data messages.

14. The method of Claim 7, wherein the step of converting further comprises the step of accessing a conversion table within the mobility gateway to convert the user profile data of the first network to user profile data useable by the second network.

15. The method of Claim 7 further including the step of updating the user profile data in the visitor location data of the second network in response to generation of a profile update.

16. The method of Claim 15, wherein the steps of updating further comprises the steps of:

transmitting a message requesting update of the user profile data from the HLR of the first network to the mobility gateway;

converting the message to a second message for use in the second network;

transmitting the second message requesting update of the user profile data from the mobility gateway to the visitor location register of the second network;

updating the user profile data and the visitor location data of the second network; and

notifying the home location register in the first network of the update.

17. The method of Claim 16, wherein the first network comprises a GSM network and the second network comprises a CDMA network.

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18. The method of Claim 16, wherein the first network comprises a TDMA network and the second network comprises a CDMA network.

19. A method for maintaining a user profile between a first network and a
5 second network, comprising the steps of:

generating a second user profile in a second network from a first user profile in a first network using a mobility gateway separating the first network and the second network; and

10 updating the second user profile in the second network in response to generation of a profile update to the first user profile in the first network.

20. The method of Claim 19, wherein the steps of updating further comprises the steps of:

15 transmitting a message requesting update of the user profile data from the HLR of the first network to the mobility gateway;

converting the message to a second message for use in the second network;

transmitting the second message requesting update of the user profile data from the mobility gateway to the visitor location register of the second network;

20 updating the user profile data and the visitor location data of the second network; and

notifying the home location register in the first network of the update.

21. The method of Claim 19, wherein the first network comprises a TDMA
25 network and the second network comprises a GSM network.

22. The method of Claim 19, wherein the first network comprises a GSM network and the second network comprises a TDMA network.

30 23. The method of Claim 19, wherein the step of generating further comprises the steps of:

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requesting registration of a mobile station from a visitor location register to a mobility gateway between the first network and the second network;

extracting user profile data from a home location register of the mobile station in the first network using the mobility gateway between the first network and the second network;

converting the user profile data from the first network into user profile data useable by the second network; and

forwarding the converted user profile data to the visitor location register of the second network.

10

24. The method of Claim 23, wherein the step of extracting further comprises the steps of:

requesting the user profile data by a location update message transmitted from the mobility gateway to the home location register in the second network; and

15

forwarding the user profile data from the home location register in the second network to the mobility gateway via insert subscriber data messages.

20

25. The method of Claim 23, wherein the step of converting further comprises the step of accessing a conversion table within the mobility gateway to convert the user profile data of the first network to user profile data useable by the second network.

FIG.1

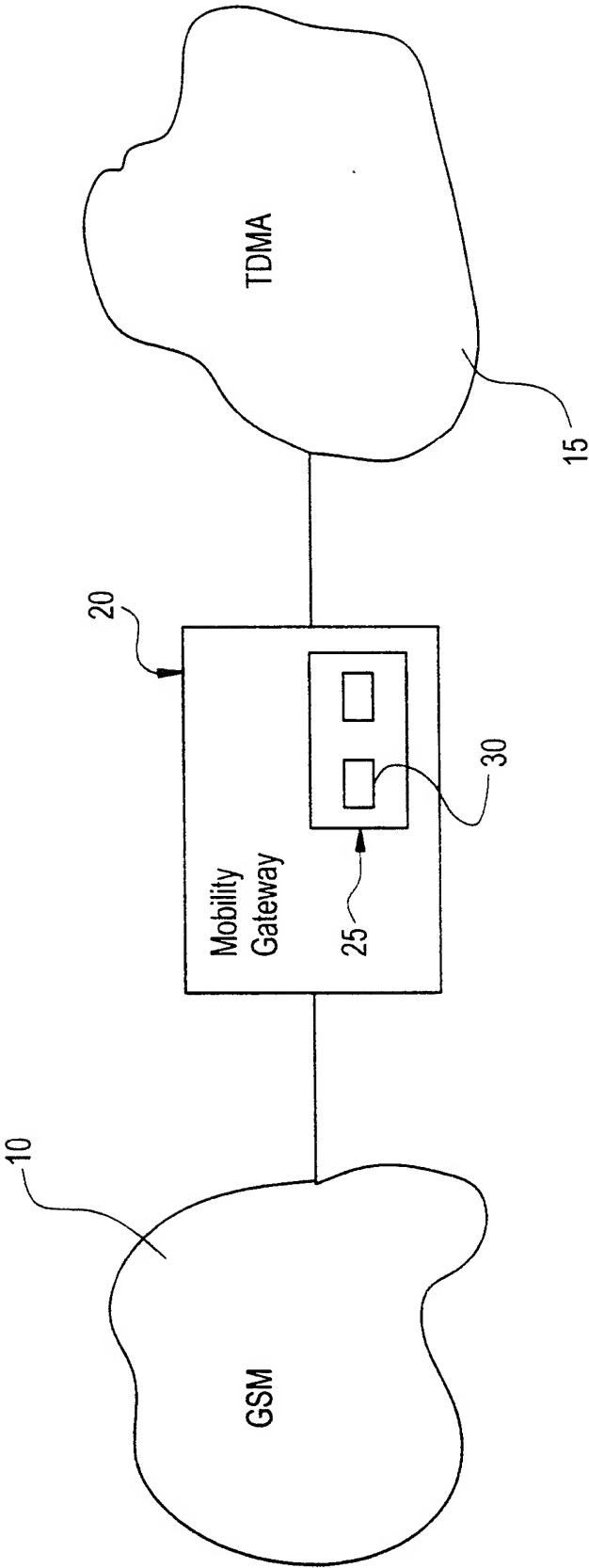


FIG. 2A

| TDMA | | | | GSM | | | |
|--|--|------------|------------|------------|--------------------------------|---|--|
| Comments | Description | Service | Value | Service | Value | Description | Comments |
| Not authorized | Asynchronous data service | No service | No service | No service | Asynchronous Data 9600 Kbps | Operator determined barring of outgoing calls | Service not provided |
| Authorized | | ADS | Inact. | No service | | | Service not provided |
| Authorized and active | | ADS | Act. | BS26 | | | Service provided |
| Service not provided | Originating Restrictions | No service | No service | No service | 2 | ODB of all outgoing inter-national calls | ODB of all outgoing calls |
| Prior agreement | | OR | 1 | OBO | | | ODB of all outgoing calls |
| Origination denied | | OR | 2 | OBO | | | ODB of all outgoing calls |
| Local calls only | | OR | 3 | OBO | | | ODB of all outgoing inter-national calls |
| Selected leading digits of directory number | Selected leading digits of directory number and local calls only | OR | 4 | OBO | 2 | ODB of all outgoing inter-national calls | ODB of all outgoing inter-national calls |
| Selected leading digits of directory number and local calls only | | OR | 5 | OBO | | | ODB of all outgoing inter-national calls |
| National Long Distance | | OR | 6 | OBO | | | ODB of all outgoing inter-national calls |
| International calls | Single directory number | OR | 7 | No service | 1 | Service not provided | Service not provided |
| Single directory number | | OR | 8 | OBO | | | ODB of all outgoing calls |

FIG. 2B

| | | | | | | | |
|--|-----------------------------------|------------|--------|-------------------------|-----------------------------|-----------------------------|-----------------------------|
| Service not provided | Call Waiting | No service | | Call Waiting | Service not provided | | |
| Service provided | | Inact. | CAW | | Inact. | Service provided | |
| Service provided and active | | Act. | CAW | | Act. | Service provided and active | |
| Service not provided | Enquiry | No service | | Call hold | Service not provided | | |
| Hold for enquiry | | ENQ | 1 | | HOLD | Act. | Service provided and active |
| Hold for enquiry with three way conversation service | | ENQ | 2 | | HOLD | Act. | Service provided and active |
| Hold for enquiry with transfer service | | ENQ | 3 | | HOLD | Act. | Service provided and active |
| Subscriber with full three party service | Enquiry | No service | | Multiparty | Service not provided | | |
| Service not provided | | ENQ | 1 | | No service | Service not provided | |
| Hold for enquiry | | ENQ | 2 | | MPTY | Act. | Service provided and active |
| Hold for enquiry with three way conversation service | | ENQ | 3 | | No service | Service not provided | |
| Hold for enquiry with transfer service | Transfer on Busy Variable service | No service | | Call forwarding on busy | Service provided and active | | |
| Subscriber with full three party service | | ENQ | 4 | | MPTY | Act. | Service provided and active |
| Service not provided | | No service | | | No service | Service not provided | |
| Service provided | Transfer on Busy Variable service | TBV | Inact. | CFB | Inact. | Service inactive | |
| Service provided and active | | TBV | Act. | CFB | Act. | Service provided and active | |

FIG. 2C

| | | | | | | | |
|-----------------------------------|---|-----------------|--------|------------|--------|--|---|
| Service not provided | Transfer on No reply Variable service | No service | | No service | | Call forwarding on no reply | Service not provided Service inactive Service provided and active |
| Service provided | | TNV | Inact. | CFNRY | Inact. | | |
| Service provided and active | | TNV | Act. | CFNRY | Act. | | |
| Service not provided | Transfer on No reply Variable service | No service | | No service | | Call forwarding on not reachable | Service not provided Service inactive |
| Service provided | | TNV | Inact. | CFNRC | Inact. | | |
| Service provided and active | | TNV | Act. | CFNRC | Act. | | Service provided and active |
| Type of subscriber | | TCL A <=> CAT B | | | | Subscriber category | |
| Mapping to be defined by operator | | | | | | | |
| Service not provided | A-number Transfer | No service | | No service | | Calling line identification presentation | Service not provided Service not provided Service provided without override category |
| Authorized | | CNIP | Inact. | No service | | | |
| Authorized and active | | CNIP | Act. | CLIP | 1 | | |
| Service not provided | A-number Presentation Restriction | No service | | No service | | Calling line identification restriction | Service not provided Service not provided Service provided |
| Authorized | | CNIR | Inact. | No service | | | |
| Authorized and active | | CNIR | Act. | CLIR | 1 | | |

FIG. 2D

| | | | | | | | | |
|--------------------------|---------------------------------------|------------|------------|------------|--------|--|--|--|
| Service not provided | A-number Presentation Override | No service | | No service | | Calling line identification presentation | Service not provided | |
| Authorized | | CNIROR | Inact. | No Service | | | Service not provided | |
| Authorized and active | | CNIROR | Act. | CLIP | 2 | | Service provided with over- ride category | |
| Service not provided | Preferred Interexchange Carrier | No service | | No service | | Primary inter- exchange carrier identifier | Service not provided | |
| Service provided | | CIC | 1- 9999 | PIC | 1-9999 | | Service provided | |
| Service not provided | SMS Term. nation Restrictions | No service | | No service | | Short Message MT/PP | Service not provided | |
| Allow specific | | SMSORD | 1 | TS21 | Avail. | | Service not provided | |
| Allow all | | SMSORD | 2 | No service | | | Service provided | |
| Service not provided | SMS Originating Restrictions | No service | | No service | | Short Message MO/PP | Service not provided | |
| Allow specific | | SMSORD | 1 | TS22 | Avail. | | Service not provided | |
| Allow all | | SMSORD | 2 | No service | | | Service provided | |
| Not authorized | Group 3 Fax | No service | | No service | | Automatic facsimile group 3 | Service not provided | |
| Authorized | | 33FAX | Inact. | No service | | | Service not provided | |
| Authorized and active | | 33FAX | Act. | TS62 | Avail. | | Service provided | |
| Abbreviations: | | | | | | | | |
| Inact. = Inactive | | | | | | | | |
| Act. = Active | | | | | | | | |
| Avail. = Available | | | | | | | | |

FIG. 3A

| GSM | | | | TDMA | | | |
|--|---|------------|--------|------------|----------|---|--|
| Comments | Description | Service | Value | Service | Value | Description | Comments |
| Service not provided | Operator determined barring of outgoing calls | No service | | OR | 7 | Operating Restrictions | International calls |
| ODB of all outgoing calls | | OBO | 1 | OR | 2 | | Origination denied |
| ODB of all outgoing international calls | | OBO | 2 | OR | 6 | | Local calls only |
| ODB of all outgoing international calls except those directed to home PLMN country | | OBO | 3 | OR | 6 | | Selected leading digits of directory number and local calls only |
| Service not provided | Call Waiting | No service | | No service | | Call Waiting | Service not provided |
| Service provided | | CAW | Inact. | CAW | Inact. | | Service provided |
| Service provided and active | | CAW | Act. | CAW | Act. | | Service provided and active |
| Service not provided | Barring of all outgoing calls | No service | | No service | | Subscriber controlled code controlled barring | Service not provided |
| Service provided | | BAOC | Inact. | CCOR | Inact. 2 | | Service inactive |
| Service provided and active | | BAOC | Act. | CCOR | Act. 2 | | Origination denied |
| Service not provided | Barring of all outgoing int. calls | No service | | No service | | Subscriber controlled code controlled barring | Service not provided |
| Service provided | | BOIC | Inact. | CCOR | Inact. 6 | | Service inactive |
| Service provided and active | | BOIC | Act. | CCOR | Act. 6 | | National Long Distance |

FIG. 3B

| | | | | | | | |
|-----------------------------|--|------------|--------|------------|-------------|---|--|
| Service not provided | Barring of all outgoing int.calls except those directed to the HPLMN | No service | | No service | | Subscriber controlled code controlled barring | Service not provided Service inactive |
| Service provided | | BOIEXH | Inact. | CCOR | Inact. 6 | | |
| Service provided and active | | BOIEXH | Act. | CCOR | Act. 6 | | National Long Distance |
| Service not provided | Call hold | No service | | No service | | Enquiry | Subscriber not authorized to the service |
| Service provided | | HOLD | Inact. | No service | | | Subscriber not authorized to the service |
| Service provided and active | | HOLD | Act. | ENQ | 1 | | Access to enquiry service |
| Service not provided | Multiparty | No service | | No service | | Enquiry | Subscriber not authorized to the service |
| Service provided | | MPTY | Inact. | No service | | | Subscriber not authorized to the service |
| Service provided and active | | MPTY | Act. | ENQ | 2 | | Subscriber with full 3-party service |
| Service not provided | Call forwarding on busy | No service | | No service | | Transfer on Busy Variable service | Service not provided |
| Service provided | | CFB | Inact. | TBV | Inact. | | Service inactive |
| Service provided and active | | CFB | Act. | TBV | Act. | | Service provided |
| Service not provided | Call forwarding on no reply | No service | | No service | | Transfer on No reply Variable service | Service not provided |
| Service provided | | CFNRY | Inact. | TNV | Inact. | | Service inactive |
| Service provided and active | | CFNRY | Act. | TNV | Act. | | Service provided |

FIG. 3C

| | | | | | | | | |
|--|--|--|---|--------|------------|--------|---------------------------------------|-----------------------------|
| Service not provided | Call forwarding on not reachable | | No service | | No service | | Transfer on No reply Variable service | Service not provided |
| Service provided | | | CFNRC | Inact. | TNV | Inact. | | Service inactive |
| Service provided and active | | | CFNRC | Act. | TNV | Act. | | Service provided |
| Subscriber category | | | CAT A <=> TCL B Mapping to be defined by operator | | | | Type of subscriber | |
| Service not provided | Calling line identification presentation | | No service | | No service | | A-Number Transfer | Service not provided |
| Service provided without override category | | | CLIP | 1 | CNIP | Act. | | Service provided and active |
| Service provided with override category | | | CLIP | 2 | CNIROR | Act. | | Service provided and active |
| Service not provided | Calling line identification restriction | | No service | | No service | | A-number Presentation Barring | Service not provided |
| Permanent mode | | | CLIR | 1 | CNIR | Act. | | Service provided and active |
| Temporary mode, presentation restricted | | | CLIR | 2 | CNIR | Act. | | Service provided and active |
| Temporary mode, presentation allowed | | | CLIR | 3 | CNIR | Act. | | Service provided and active |

FIG. 3D

| | | | | | | | |
|----------------------|---|------------|--------|------------|--------|---------------------------------|-----------------------|
| Service not provided | Primary inter-exchange carrier identifier | No service | | No service | | Preferred Interexchange Carrier | Service not provided |
| Service provided | | PIC1 | 1-9999 | CIC | 1-9999 | | Service provided |
| Service not provided | Short Message MT/PP | No service | | No service | | SMS Termination Restrictions | Service not provided |
| Service provided | | TS21 | Avail. | SMSTRD | 1 | | Allow all. |
| Service not provided | Short Message MO/PP | No service | | No service | | SMS Origination Restrictions | Service not provided |
| Service provided | | TS22 | Avail. | SMSORD | 1 | | Allow all. |
| Service not provided | Automatic facsimile group 3 | No service | | No service | | Group 3 Fax | Service not provided |
| Service provided | | TS62 | Avail. | G3FAX | Act. | | Authorized and active |
| Service not provided | Asynchronous Data 9600 Kbps | No service | | No service | | Asynchronous data service | Service not provided |
| Service provided | | BS26 | Avail. | ADS | Act. | | Authorized and active |

Abbreviations:

Inact. = Inactive

Act. = Active

Avail. = Available

FIG.4

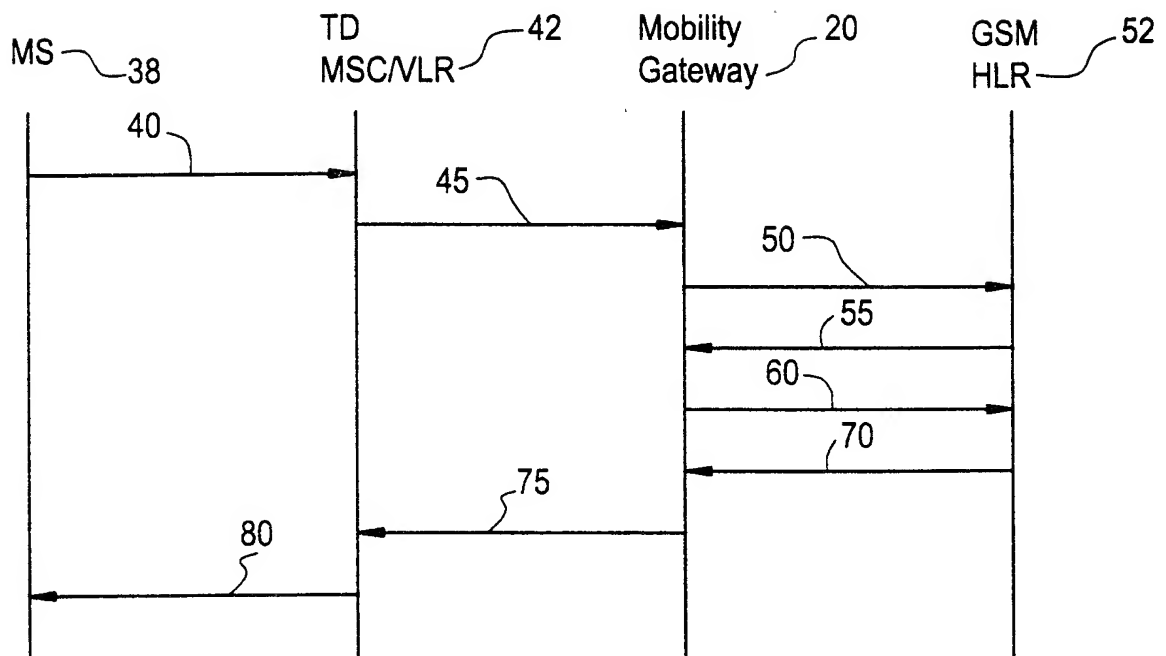


Fig.5

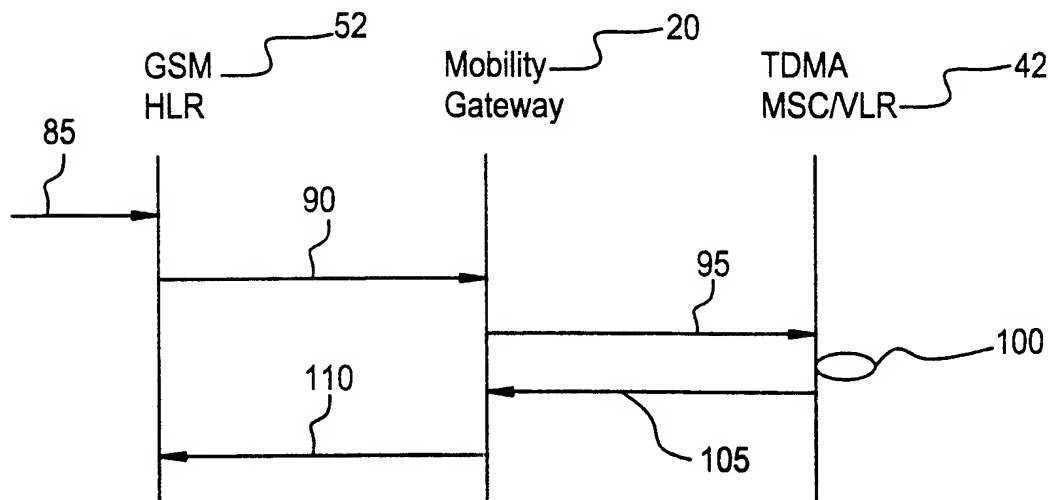


FIG.6

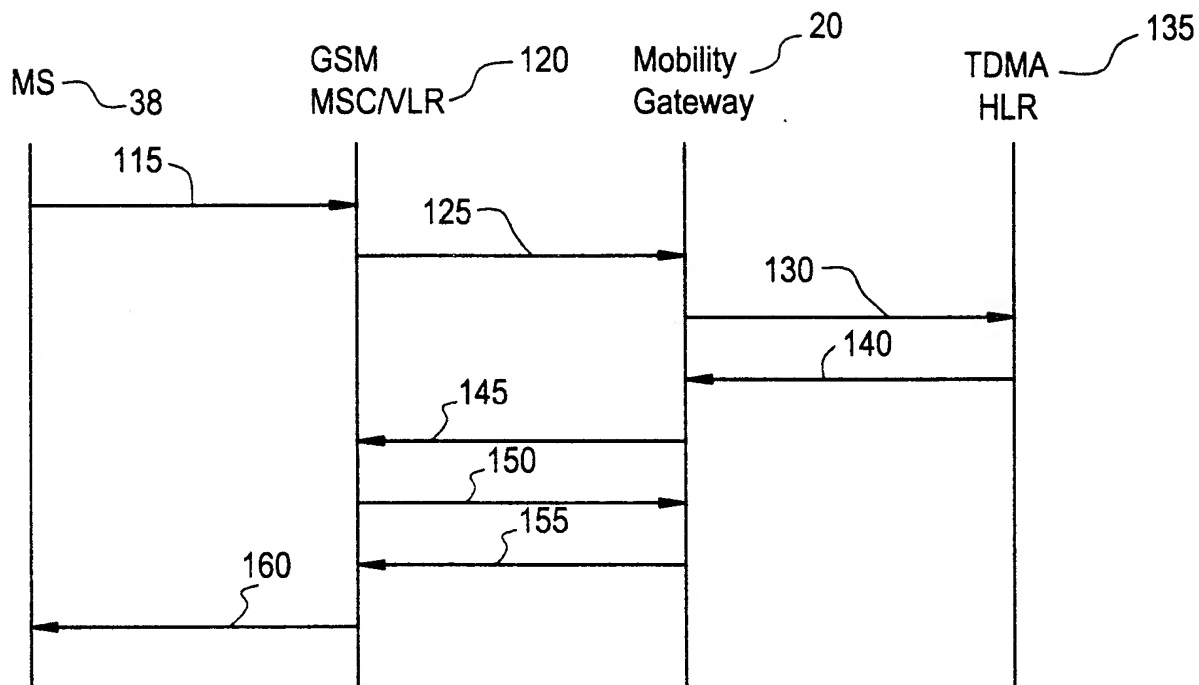
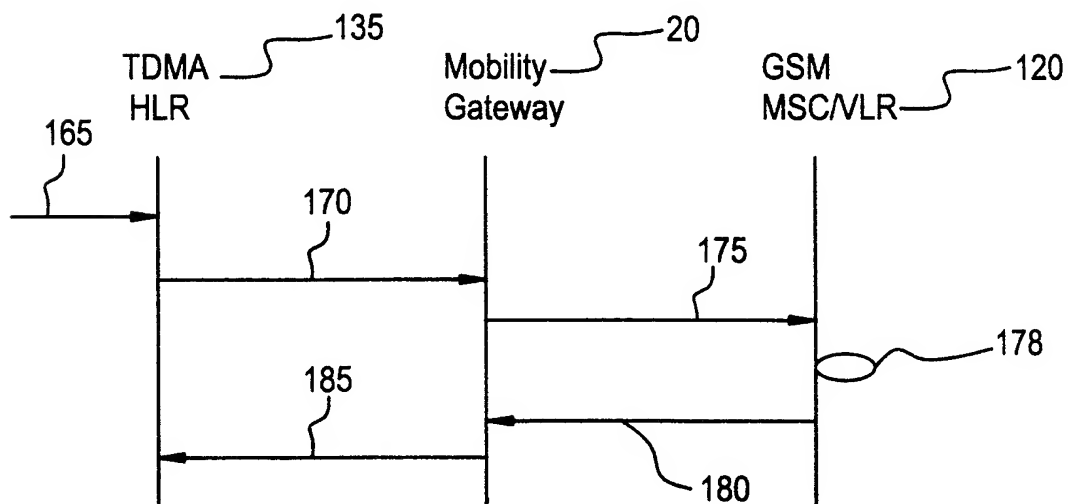


Fig.7



INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE 00/00330

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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| Y | page 3, line 8 -page 4, line 3 page 5, line 4 - line 22 page 7, line 29 -page 8, line 29 page 9, line 15 -page 10, line 9 page 11, line 29 -page 12, line 21 | 15-24 |
| Y | YU J I: "IS-41 FOR MOBILITY MANAGEMENT" INTERNATIONAL CONFERENCE ON UNIVERSAL PERSONAL COMMUNICATIONS,US,IEEE, NEW YORK, NY, 1992, pages 158-162, XP000494916 the whole document | 15-24 |
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☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

14 July 2000

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Authorized officer

Coppieters, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/SE 00/00330

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